Dartmouth Toxic Metals
Superfund Research Program

Barriers to Private Well Water Testing in New Hampshire as Revealed by a Statewide Survey of Well Owners

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http://www.dartmouth.edu/~toxmetal

Project Aims

A. Estimate statewide rates of well water testing and treatment for arsenic

B. Assess the importance of a variety of factors influencing the rate of water testing and treatment

C. Identify subpopulations that are less likely to test and treat their water

F. Design intervention strategies to overcome identified barriers to testing and treatment

Project Phases

Phase 1: Focus Groups

Phase 2: Survey Design

Phase 3: Survey Recruitment

Phase 4: Survey Response

Phase 5: Survey Analysis

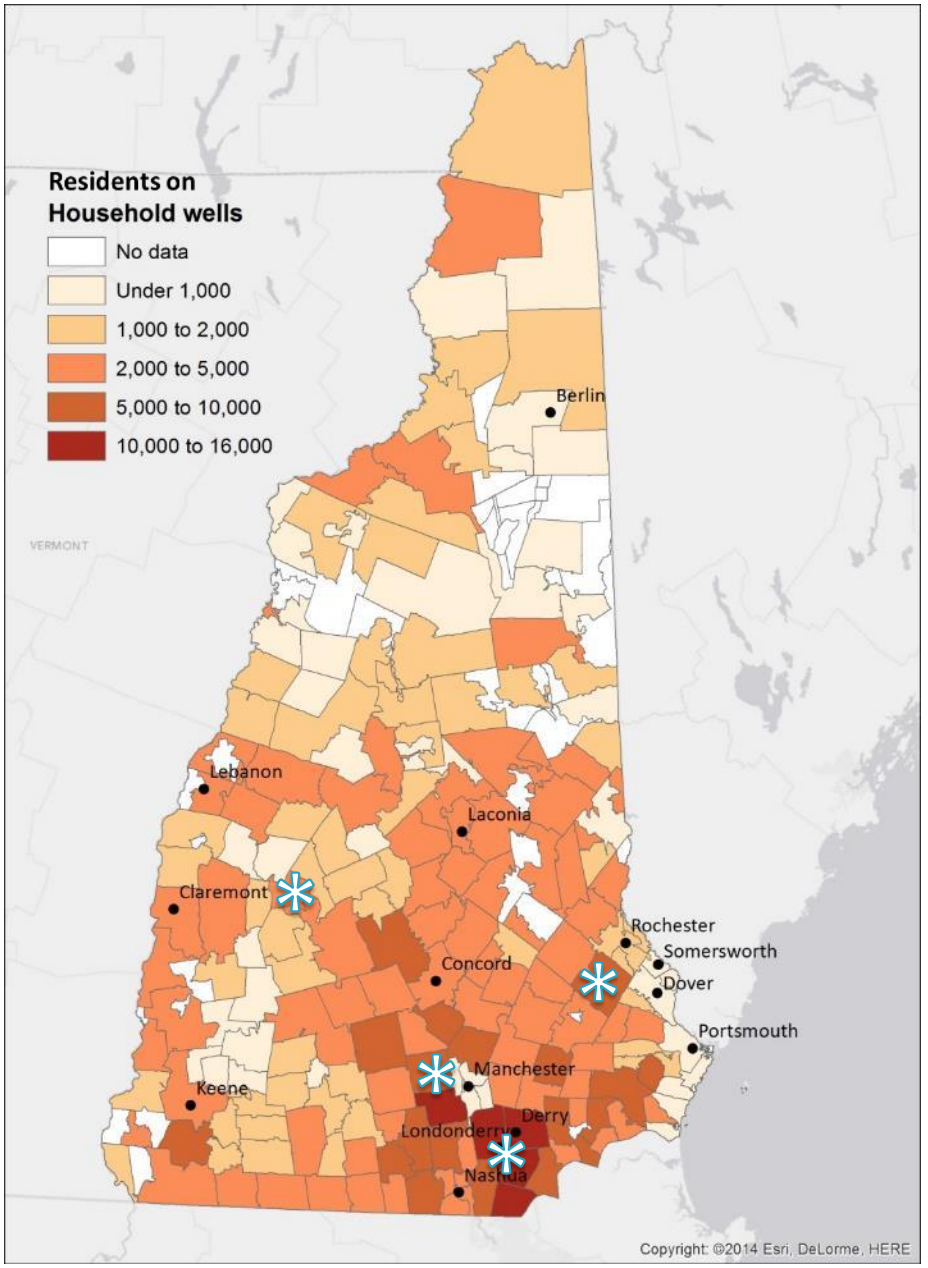
Phase 1: Focus Groups

New London
March 4, 2014, 6 P.M.
Town Office, 375 Main Street
7 participants

Barrington
March 5, 2014, 2 P.M.
Town Office, 333 Calef Highway
10 participants

Goffstown
March 6, 2014, 7 P.M.
Town Office, 16 Main St.
7 participants

Londonderry
March 19, 2014, 4 P.M.
Town Office, 268B Mammoth Road
7 participants



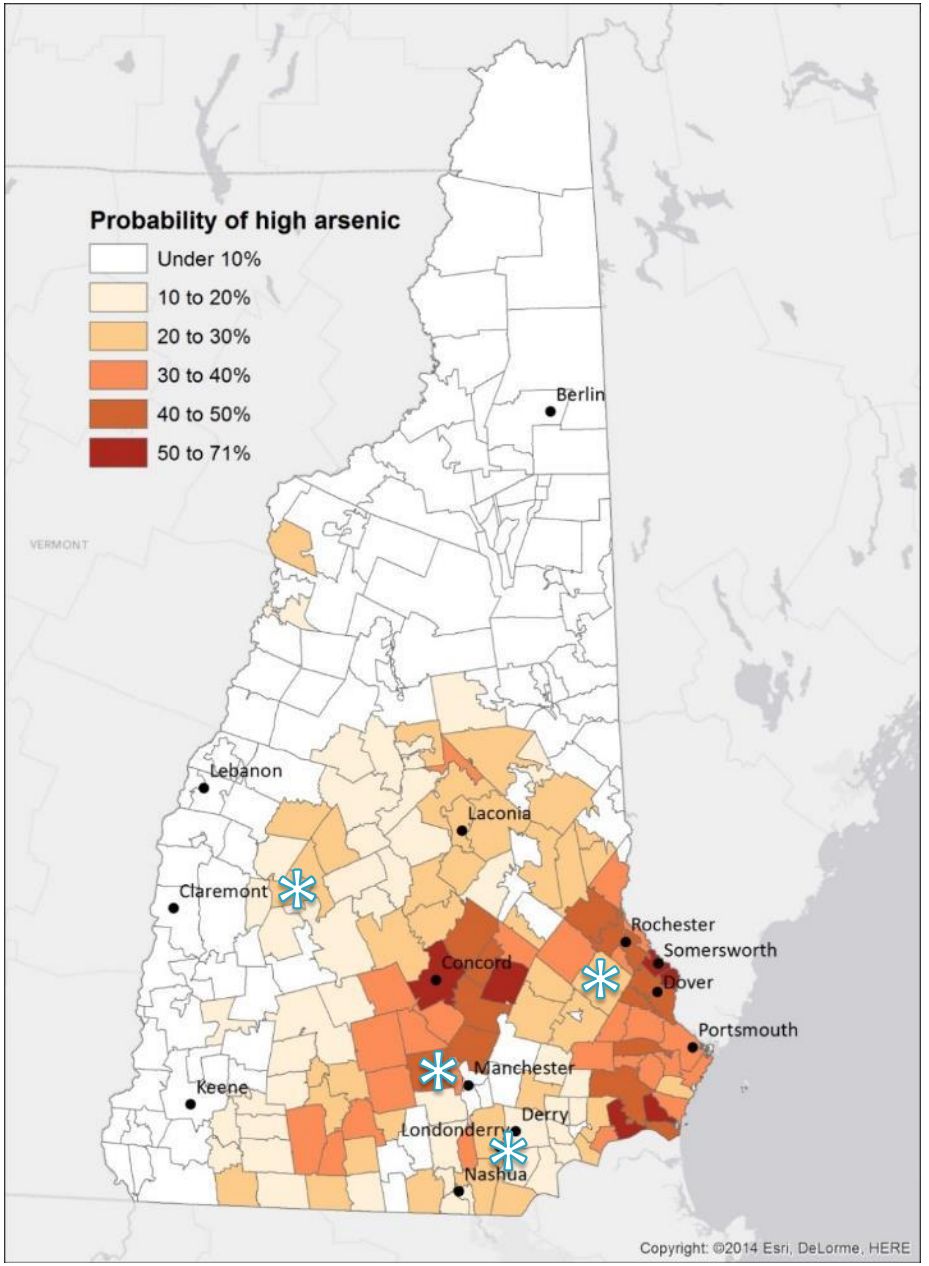
Phase 1: Focus Groups

Among the participants were:

- a town manager
- a town administrator
- two health officers
- two building inspectors
- a real estate agent
- a code enforcement officer
- planning board members
- a director of public works
- a diverse group of residents

Topics addressed:

1. Well water quality
2. Well water testing
3. Well water test results
4. Well water treatment
5. Sources of information



Topic 1: Water Quality

- Many participants used well water as their primary source of water, and several noted its superior taste and clarity.
- A few participants preferred to drink bottled water because their well water had an atypical odor or taste.
- Participants associated well water quality with taste, smell, and appearance.
- Many participants felt that it was common knowledge that geology affected well water quality; however, **few understood the scale of geological variability**.
- Participants felt that information about local geology and its influence on water quality was not readily available.
- Participants believed that **those who did not have a well as a child may not realize that they are responsible** for their water quality.

Topic 2: Water Testing

- Participants disagreed as to whether water testing was common practice in their community.
- Few had any knowledge of local, state, or federal water testing recommendations.
- A majority of participants **recalled last testing their water during a real estate transaction**, but many had not tested since that time.
- Several who lived in the same home for a long period of time **had not tested their water since they moved in** because it always tasted and looked good.
- Participants identified **awareness, cost and inconvenience as the major barriers** to regular water testing.
- Many commented that a locally-sponsored educational campaign would prompt many people to test their water.
- Some also mentioned that **town websites and offices would be ideal locations** for more information.

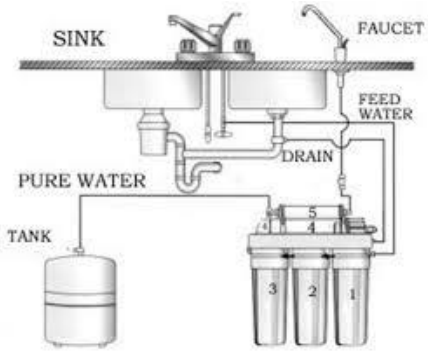
Topic 3: Test Results


F.A.S.T. Laboratories

TEST REPORT

- Most participants found it difficult to decide what substances to test for; many relied entirely on a professional, including well drillers, home inspectors, town building inspector, or real estate agent.
- **Participants disagreed over whether water test results were easy to interpret.**
- A few participants did not trust private labs because of their motivation to sell other services and products.
- Participants mentioned that they could search the internet to determine whether their results were acceptable.

Topic 4: Treatment



- The primary reason for installing a water treatment system was to **address aesthetic issues**.
- All participants with a treatment system commented that it was **costly and onerous to maintain**.
- **No one had tested** their water after their system was installed.
- **Cost** deterred many from treating their water.
- All agreed that choosing a treatment system was a **complicated process** and most participants relied on an expert.
- Many found it **difficult to use information** about treatment systems on the internet.
- Several expressed frustration over the **lack of recommendations** for vendors and treatment systems; others received different quotes for the same treatment system; two groups commented that a **rating system or certification process** would be highly beneficial for consumers.

Topic 5:
Sources of Information

- Stated a need for more information about:
  - local geology and aquifers
  - potential health effects of contaminated water
  - specific information about local laboratories
- Many participants mentioned that the NH DES or “the State” was the best place to go for information.
- Some felt that general information was accessible, but **requested more information about local conditions.**
- Some suggested that **information or maps about other local test results** would be highly beneficial.

Phase 2: Survey Design

Sections on SurveyMonkey (31 to 40 questions):

1. Cover letter and confirmation of eligibility
2. Sources of water
3. Sources of information about water (including NH DES flyer)
4. Water testing (including motivations and barriers)
5. Water treatment (including motivations and barriers)
6. Household details
7. Demographic information
8. iPad drawing participation
9. Thank you and link to Dartmouth Superfund page

Phase 3: Survey Recruitment

THAYER SCHOOL OF ENGINEERING AT DARTMOUTH
14 Engineering Drive | Hanover, NH 03755

You could win an iPad!

You Deserve to Know What You're Drinking!

Dartmouth researchers want to help you find out.

By completing our survey, you will be supporting efforts to let more people know why and how to get their well water tested.

Please take our quick online survey:

surveymonkey.com/s/nhwells

(at this web address or by scanning QR code at right)

Thanks for participating,

Mark Borsuk
Associate Professor of Engineering
engineering.dartmouth.edu

RESEARCH SPONSORED BY:
NH Department of Environmental Services

<<Owner>>
<<Co_Owner>>
<<Mailing_Ad>>
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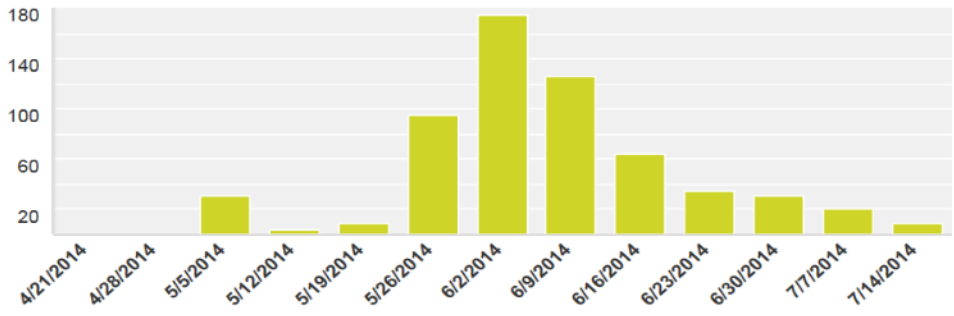
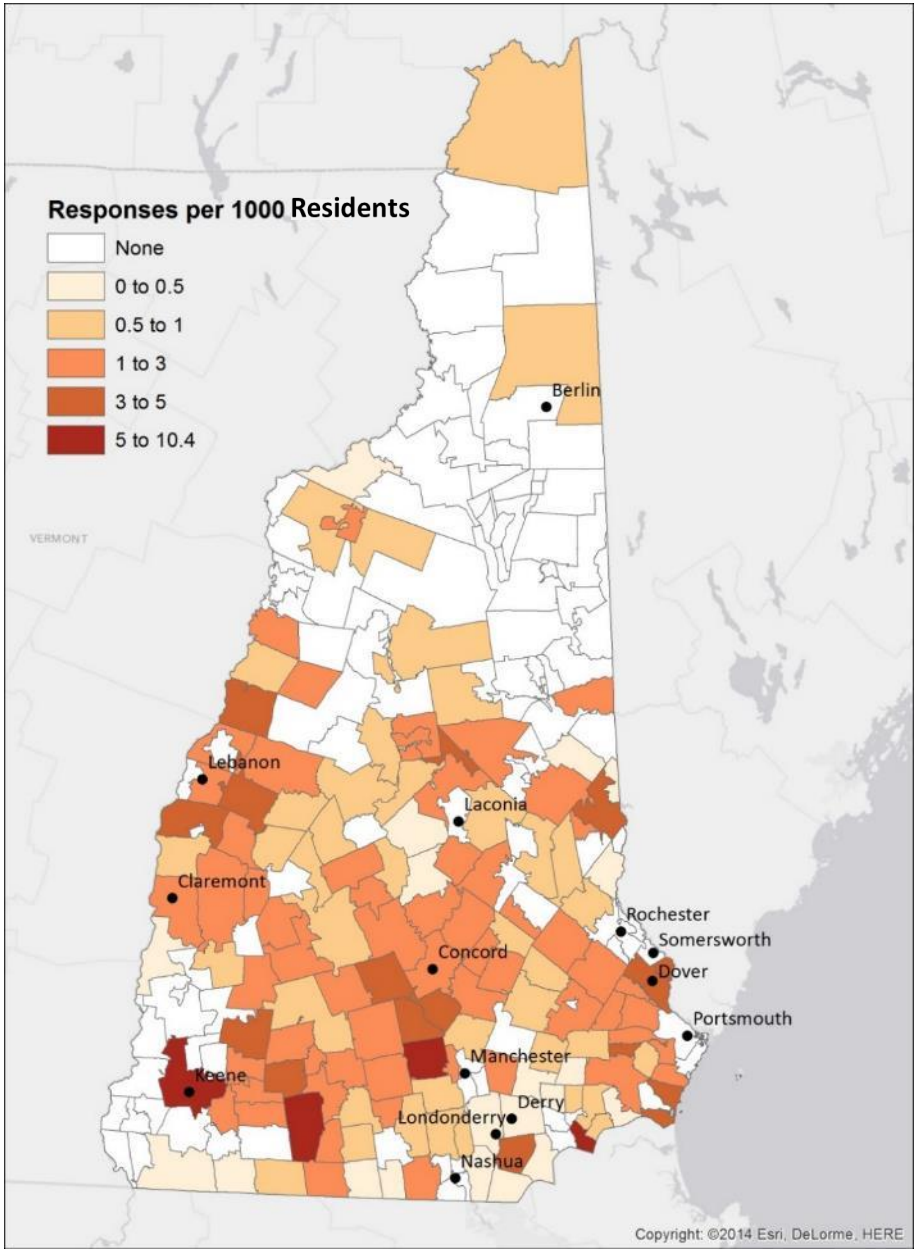
Postcards sent to about 7,200 addresses with wells

Phase 4: Survey Response

About 700 responses total

Response Timing





Summary of Survey Responses

- 82% of respondents drink their tap water “always” or “frequently”
- Many respondents (20%) have not spoken with anyone about the safety of well water
- **Among the 80% of people who DID test their water:**
  - The most common time since testing is 3-10 years ago (29%)
  - Most had it tested as part of a real estate transaction (40%)
  - The most common concerning test results were (Q13):
    - Arsenic (24%)
    - Radionuclides (19%)
    - Iron (20%)

Summary of Survey Responses

Among the 20% of respondents who DID NOT test their water:

- The most common reasons for not testing were:
  - I meant to have it tested but never got around to it (42%)
  - I didn't know how to go about having it tested (38%)
  - The water looks, smells, and tastes clean (33%)
  - I have not had any health problems caused by drinking the water (28%)
  - The testing costs too much (25%)

- The most common conditions which would prompt respondents to test their water were:
  - A change in the taste, smell, or appearance of the water (81%)
  - Hearing that a neighbor's water had problems (70%)
  - Hearing that other wells in town had problems (63%)
  - A coupon for a discount on a water test (61%)
  - A mobile testing lab visiting my town (60%)
  - Seeing a news article about a water quality problem in the area (59%)

Summary of Survey Responses

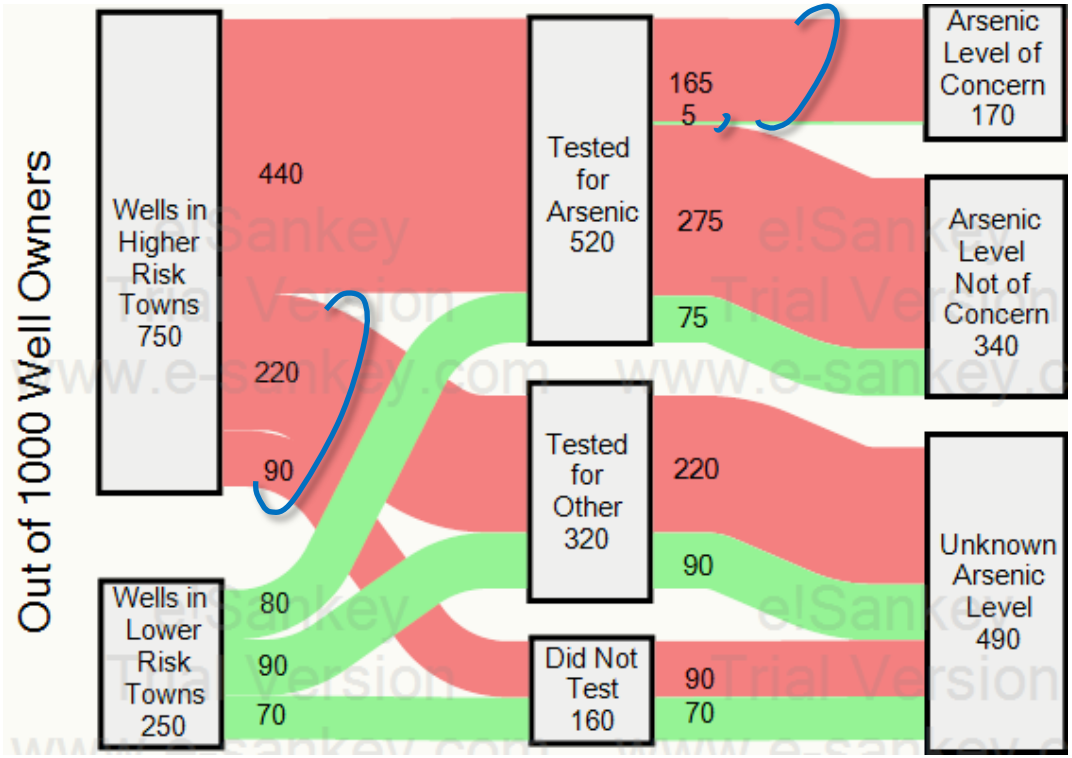
- **Among the 67% of respondents who DO treat their water:**
  - 35% treat because they had the water tested and the results indicated it should be treated
  - 30% treat because the water tasted, smelled, or looked bad
  - 35% treat for a variety of other reasons
  - 39% have NEVER tested their water since starting to use their water treatment system; 21% test only RARELY (about every 5-10 years) (Q23)
- **Among the 33% of respondents who DO NOT treat their water:**
  - 46% have had their water tested and the results suggested there was no need to treat
  - 16% believe a treatment system is too expensive or difficult to install, use, and maintain

Summary of Survey Responses

Some demographic facts:

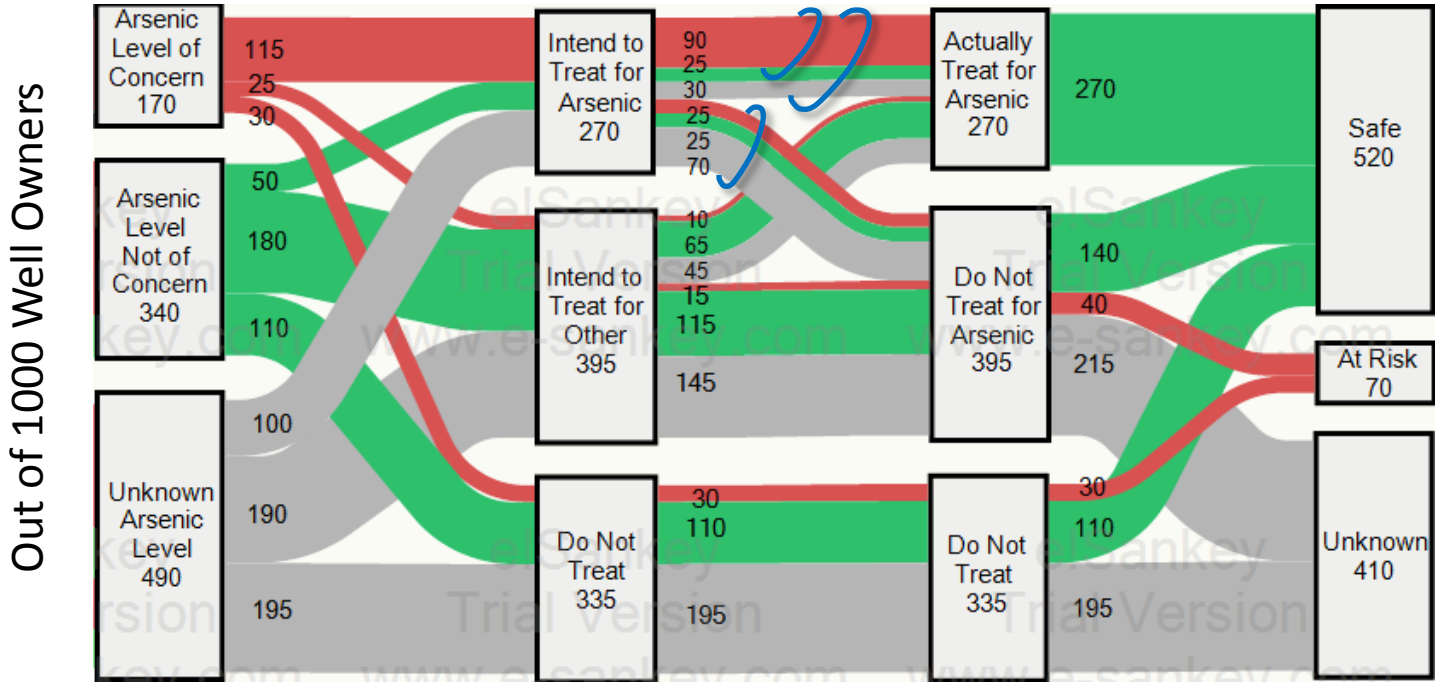
- 88% respondents live in a single-family residence
- 55% have lived in their current location for more than 10 years 76% have been a resident of NH for more than 10 years
- 36% had a well at their previous residence
- 30% had a well at their childhood home
- 83% are ‘not at all likely’ to move in the next 12 months
- The average household size is about 2.8 people
- The average age of respondents is 55 years, with a standard deviation of 12.5 years
- 96% are White/Caucasian
- 72% have at least a college degree
- 54% are employed full time and 21% are retired
- 33% reported an annual income of more than $100,000/yr

Phase 5: Survey Analysis of Testing Rates



- About 40% (310/750) of those from higher risk arsenic towns have not tested their water for arsenic.
- Almost 40% (165/440) of those from higher risk arsenic towns who tested their water for arsenic received test results that are ‘concerning’ to them.
- Compared to the less than 10% (5/80) of those from lower risk arsenic towns who received ‘concerning’ test results.

Survey Analysis of Treatment Rates

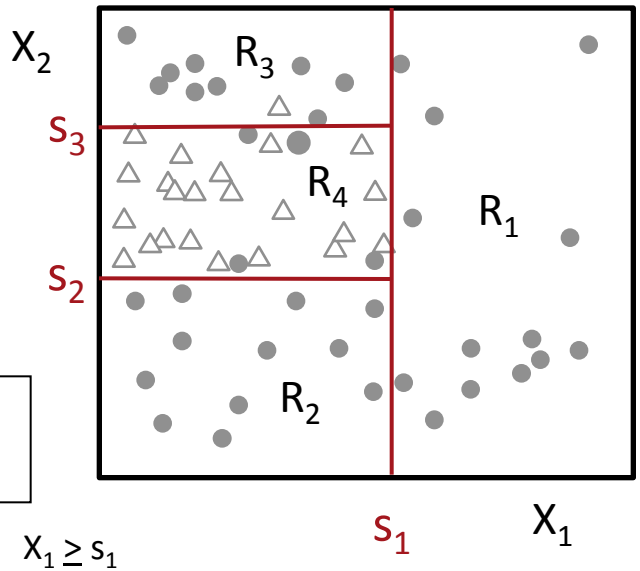


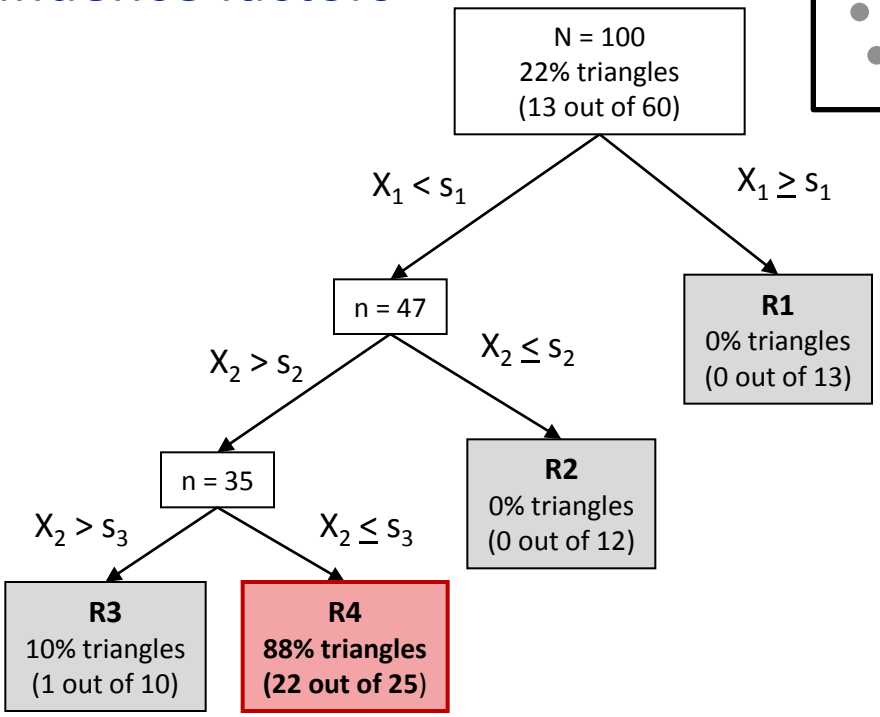
- Only about half (145/270) of those who treat their water with the intent to remove arsenic actually have treatment systems that are effective at arsenic removal.
- Most of those who are correctly treating (90/145) are those who received concerning arsenic test results.
- Most of those who are NOT correctly treating their water are those who have not had their water tested for arsenic.

Survey Analysis of Influence Factors

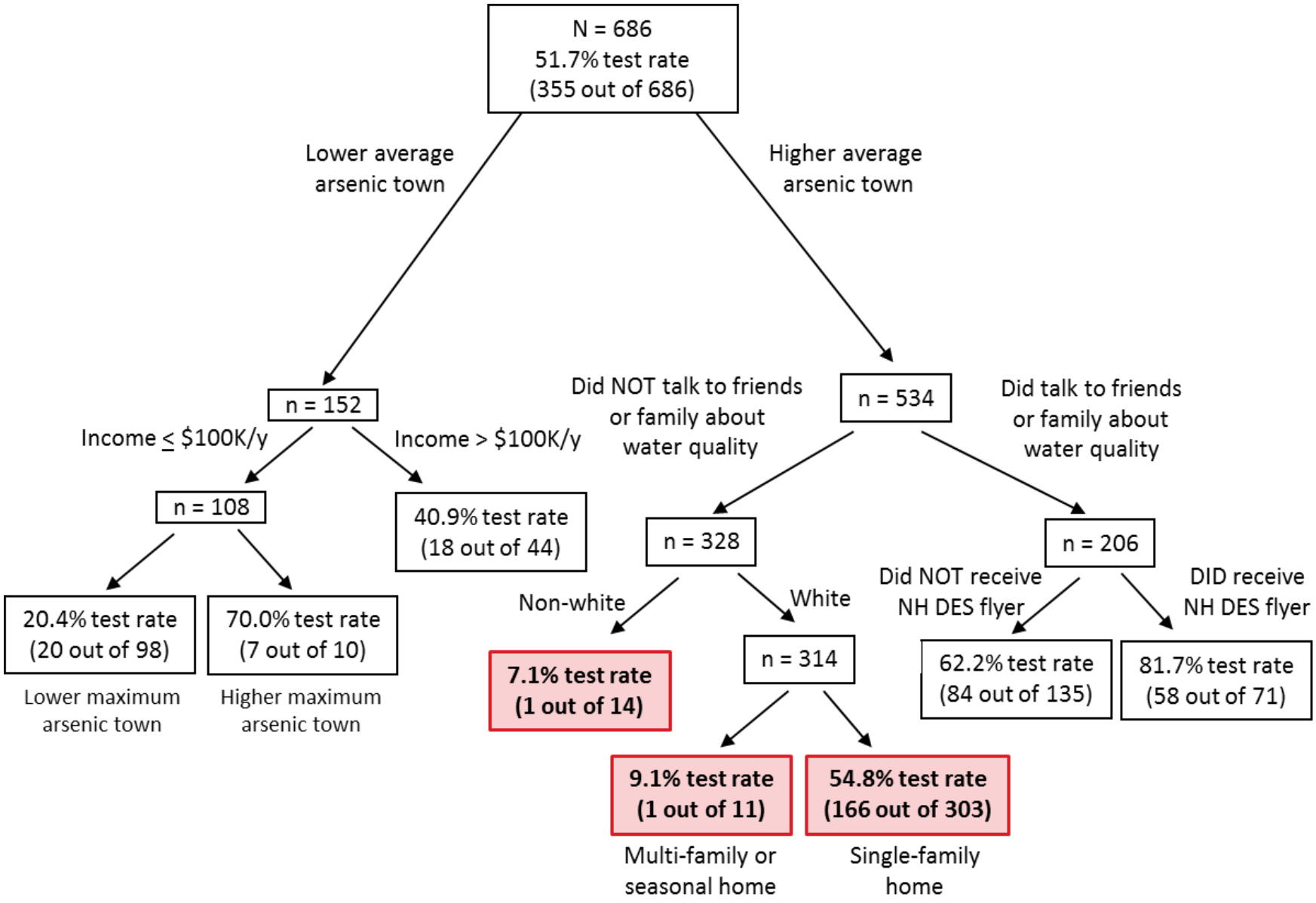
Classification and Regression Trees (CART)

→ Attempt to predict a categorical variable (e.g., *test / no test*) using a series of splits of influence factors



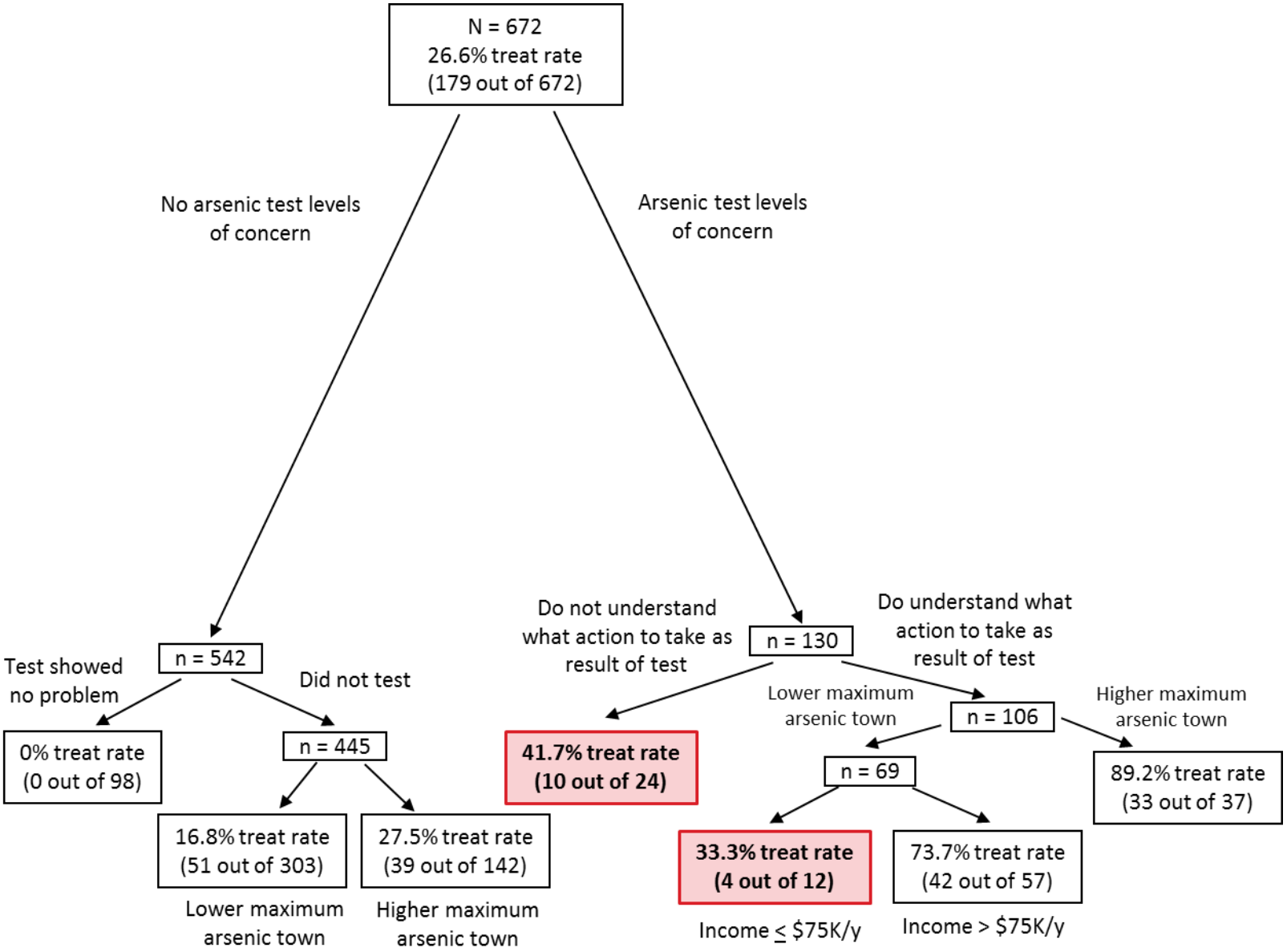


Factors Influencing Arsenic Testing



Arrow length proportional to amount of variation explained.

Factors Influencing Arsenic Treatment



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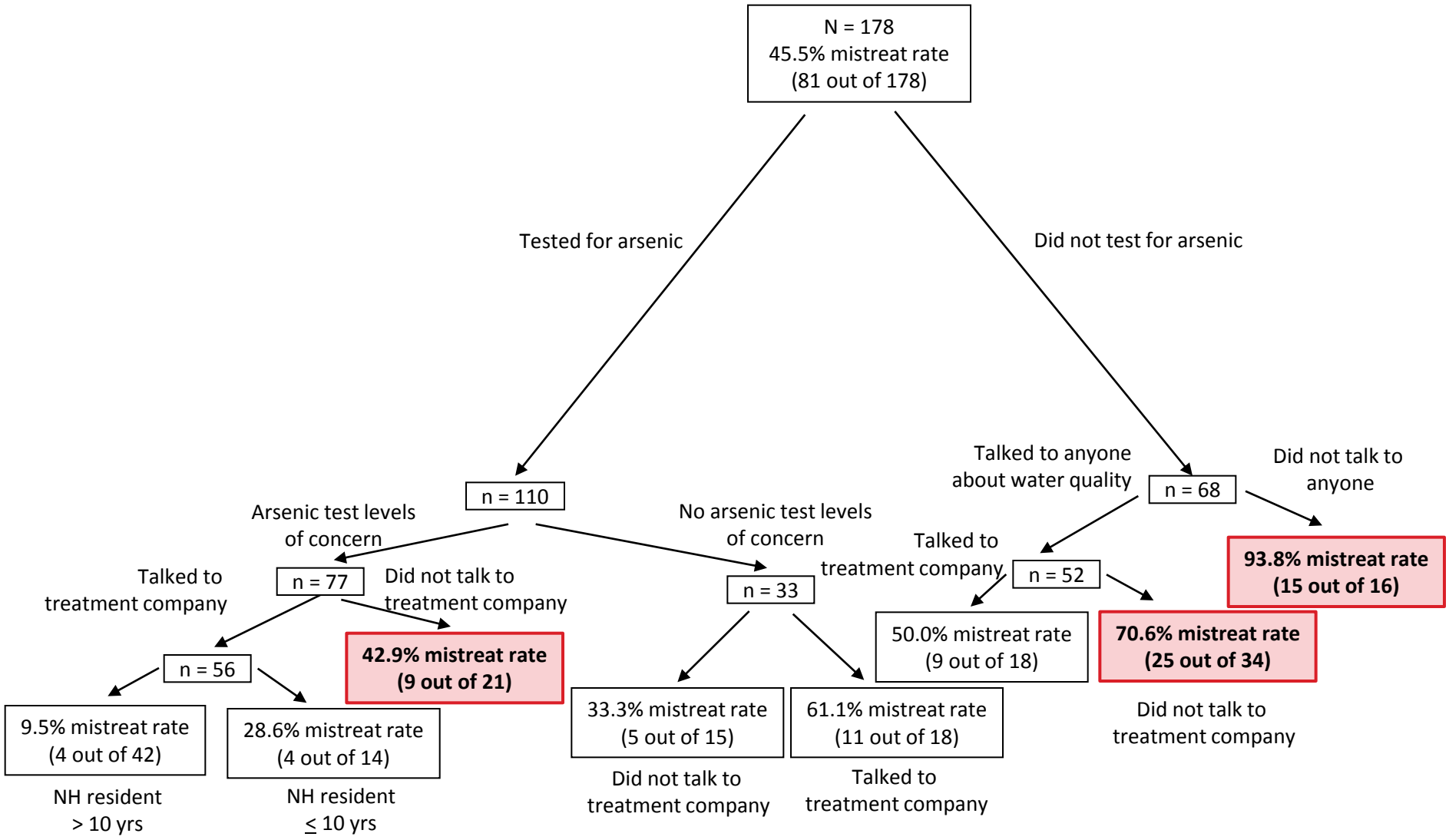
Factors Influencing Arsenic Mistreatment



Arrow length proportional to amount of variation explained.

Target Subpopulations

- **Target populations for water testing** include residents from high arsenic towns (especially non-white residents or those in seasonal or multi-family buildings).
  → Engaging in face-to-face discussions should be an effective intervention to encourage testing.
- **Target populations for water treatment** include residents who have received test results showing 'levels of concern', but who either do not understand what action to take or are low-income.
  → Providing treatment information with test results or financial assistance may be effective interventions.
- **Target populations for correcting mistreatment** include residents who have not performed an arsenic test, in particular those who have not previously talked to anyone about water quality, especially a water treatment company.
  → The interventions identified above should be effective here, especially encouraging re-testing and connecting with a qualified water treatment expert.

Intervention Design

Types of Interventions:

- Town communication campaign
- Intercept campaign
- Well water testing events

Experimental Design:

- A total of six towns were recruited and each of three different interventions will be implemented in four different towns.

Town	Town Communication	Intercept Campaign	Testing Event
A	X		X
B		X	X
C	X	X	
D		X	X
E	X		X
F	X	X	

→ All combinations of every two initiatives are duplicated

→ All individual effects and interactions can be estimated

→ Assumes 'independence of towns'

Intervention Planning

- We are currently working with all six towns to select locations and communication channels.
- Our subcontractor has created visual and message communication materials.
- We are in the process of vetting material with partners and focus groups.
- Implementation will occur over the next two months.
- We will be evaluating both process and outcome metrics.

Community Health Institute
New Hampshire's Public Health Institute

Questions?